

WHAT IS CLAIMED IS:

1. A data selection apparatus comprising:  
search units each of which search units  
5 includes table search circuits and a first circuit  
which performs a first selection process in which a  
table search circuit which outputs data is selected  
from table search circuits each of which succeeds in  
a search based on input data; and  
10 a second circuit which performs a second  
selection process in which a search unit which  
outputs data is selected from search units each of  
which includes a table search circuit which succeeds  
in a search; wherein  
15 when said first circuit receives a first  
signal which indicates that there is a table search  
circuit which succeeds in a search, said first  
circuit sends a second signal to said second circuit  
before performing said first selection process, said  
20 second signal indicating that there is at least one  
table search circuit which succeeds in a search;  
said second circuit performs said second  
selection process when said second circuit receives  
said second signal; and  
25 a search unit which is selected by said  
second selection process outputs data.

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2. The data selection apparatus as claimed  
in claim 1, wherein each of said search units has a  
third circuit, outside of said first circuit, which  
third circuit sends said first signal to said second  
35 circuit; and  
said first circuit performs said first  
selection process at the same time as when said

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an entry matching a search key which is a bit sequence of a part of input data, said data output control circuit performing a first selection process in which the highest priority output data is

5 selected from outputs of said table search circuits;

a unit output control device which performs a second selection process in which the highest priority output data is selected from outputs of said search units;

10 data search success signal output means which sends a data search success signal to said data output control circuit from a hit circuit which is a table search circuit which succeeds in a search; and

15 unit search success signal output means which sends a unit search success signal indicating that there is at least said hit circuit in said search unit to said unit output control device before said data output control device performs said  
20 first selection process; wherein

said data output control device starts said first selection process upon receiving said data search success signal and said unit output control device starts said second selection process  
25 upon receiving said unit search success signal; and

a data output control circuit in a search unit which is selected by said unit output control device selects output data of a table search circuit.

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7. The data selection apparatus as claimed in claim 6, further comprising:

35 first stage search units each of which is said search unit;

nth ( $n \geq 2$ ) stage search units each of

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which nth stage search units includes (n-1)th stage search units and an (n-1)th stage unit output control device which selects the highest priority (n-1)th stage search unit from said (n-1)th stage search units; and

an nth stage unit output control device which selects the highest priority nth stage search unit from said nth stage search units; wherein said (n-1)th stage unit output control devices send nth stage unit search success signals to said nth stage unit output control device before each of said (n-1)th stage unit output control device selects an (n-1)th stage search unit; and an (n-1)th stage search unit output selection process in said (n-1)th stage unit output control devices and an nth stage search unit output selection process in said nth stage unit output control device are performed in parallel so that output data of a table search circuit is selected.

8. The data selection apparatus as claimed in claim 7, wherein each of said first stage search units sends a unit search success signal to unit output control devices of second or later stages instead of (k-1)th ( $2 \leq k \leq n$ ) stage unit output control devices sending said unit search success signal to a kth stage unit output control device.

9. The data selection apparatus as claimed in claim 6, wherein said data output control circuit includes a CAM output control circuit including

small-scale logic circuits divided by flip-flops in which time series pipeline processing is performed; and

5       said unit output control device also includes small-scale logic circuits divided by flip-flops in which time series pipeline processing is performed.

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10. The data selection apparatus as claimed in claim 7, wherein said data output control circuit includes a CAM output control circuit  
15 including small-scale logic circuits divided by flip-flops in which time series pipeline processing is performed; and

20       said unit output control device also includes small-scale logic circuits divided by flip-flops in which time series pipeline processing is performed

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11. The data selection apparatus as claimed in claim 6, wherein each of said table search circuits includes a RAM and an MPU.

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12. The data selection apparatus as claimed in claim 7, wherein each of said table  
35 search circuits includes a RAM and an MPU.

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13. A packet processing apparatus  
including a data selection apparatus, said data  
5 selection apparatus comprising:  
search units each of which search units  
includes table search circuits and a first circuit  
which performs a first selection process in which a  
table search circuit which outputs data is selected  
10 from table search circuits each of which succeeds in  
a search based on an input packet; and  
a second circuit which performs a second  
selection process in which a search unit which  
outputs data is selected from search units each of  
15 which includes a table search circuit which succeeds  
in a search; wherein  
when said first circuit receives a first  
signal which indicates that there is a table search  
circuit which succeeds in a search, said first  
20 circuit sends a second signal to said second circuit  
before performing said first selection process, said  
second signal indicating that there is at least one  
table search circuit which succeeds in a search;  
said second circuit performs said second  
25 selection process when said second circuit receives  
said second signal; and  
a search unit which is selected by said  
second selection process outputs data, said data  
being used as a destination address to which said  
30 input packet is transferred.

35 14. The packet processing apparatus as  
claimed in claim 13, wherein each of said search  
units has a third circuit, outside of said first

circuit, which third circuit sends said first signal to said second circuit; and

5       said first circuit performs said first selection process at the same time as when said third circuit sends said first signal to said second circuit.

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15       ~~15.~~ A packet processing apparatus including a data selection apparatus, said data selection apparatus comprising:

15       search units each of which search units comprises table search circuits and a data output control circuit, said table search circuit selecting data from a stored data table, which data includes an entry matching a search key which is a bit sequence of a part of an input packet, said data  
20       output control circuit performing a first selection process in which the highest priority output data is selected from outputs of said table search circuits;

25       a unit output control device which performs a second selection process in which the highest priority output data is selected from outputs of said search units;

30       data search success signal output means which sends a data search success signal to said data output control circuit from a hit circuit which is a table search circuit which succeeds in a search; and

35       unit search success signal output means which sends a unit search success signal indicating that there is at least said hit circuit in said search unit to said unit output control device before said data output control device performs said first selection process; wherein

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15            16. The packet processing apparatus as  
claimed in claim 15, said data selection apparatus  
further comprising:

20           nth ( $n \geq 2$ ) stage search units each of  
which nth stage search units includes (n-1)th stage  
search units and an (n-1)th stage unit output  
control device which selects the highest priority  
(n-1)th stage search unit from said (n-1)th stage  
25 search units; and

30       said (n-1)th stage unit output control  
      devices send nth stage unit search success signals  
      to said nth stage unit output control device before  
      each of said (n-1)th stage unit output control  
      device selects an (n-1)th stage search unit; and

an (n-1)th stage search unit output  
35 selection process in said (n-1)th stage unit output  
control devices and an nth stage search unit output  
selection process in said nth stage unit output



control device are performed in parallel so that output data of a table search circuit is selected.

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17. The packet processing apparatus as claimed in claim 16, wherein each of said first stage search units sends a unit search success  
10 signal to unit output control devices of second or later stages instead of (k-1)th ( $2 \leq k \leq n$ ) stage unit output control devices sending said unit search success signal to a kth stage unit output control device.

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